PENDING CLAIMS

14. A method comprising:

a) providing an array composition comprising:

i) a substrate with a surface comprising discrete sites; and

ii) a population of microspheres comprising at least a first and a second subpopulation, wherein the microspheres of each subpopulation each comprise a plurality of different target analytes;

wherein said microspheres are distributed on said surface;

b) contacting said array composition with a first set of readout probes;

c) detecting the presence of a first target analyte.

15. The method according to claim 14 further comprising:

d) contacting said array composition with a second set of readout probes;

e) detecting the presence of a second target analyte.

16. The method according to claim 14, wherein said microspheres are randomly distributed on said surface.

17. The method according to claim 14, wherein said first set of readout probes comprises at least first and second readout probes, wherein said first and second readout probes comprise first and second labels, respectively.

18. The method according to claim 17, further comprising detecting said first label as an indication of the presence of said first target analyte.

19. The method according to claim 14, wherein the microspheres of said first and second subpopulation each comprise a plurality of target analytes from a first and second target source, respectively.

20. The array composition according to claim 19, wherein said first and second target source are first and second patients, respectively.

21. A method of genotyping comprising:

a) providing an array composition comprising:

I) a substrate with a surface comprising discrete sites; and

ii) a population of microspheres comprising at least a first and a second subpopulation, wherein the microspheres of each subpopulation each comprise at least first and second target analytes attached to said microspheres with first and second attachment moieties, respectively;

wherein said microspheres are randomly distributed on said surface;

b) contacting said array composition with a first set of extension probes that hybridize with at least said first target sequence adjacent to a first detection position to form an extension complex;

c) contacting said extension complex with a composition comprising

i) at least a first nucleotide;

ii) polymerase;

wherein said polymerase extends a first extension probe with said first nucleotide when said first nucleotide is complementary to said first detection position of said first target sequence; and

d) detecting the presence of said first nucleotide.

22. The method according to claim 21, wherein said first nucleotide comprises a label.

23. (Amended) A method of determining the identification of a nucleotide at a detection position in at least a first target sequence comprising:

a) providing an array composition comprising:

i) a substrate with a surface comprising discrete sites; and

ii) a population of microspheres comprising at least a first and a second subpopulation, wherein the microspheres of each subpopulation each comprise a plurality of different target sequences, wherein said microspheres are distributed on said surface;

b) forming a first hybridization complex between said first target sequence and at least a first readout probe; and

c) determining the nucleotide at said detection position.

24. A method according to claim 23, wherein said target sequence comprises a first and a second target domain, wherein said first hybridization complex comprises said first target sequence, a first readout probe hybridized to said first domain and a second readout probe hybridized to said second domain, wherein at least one of said readout probes comprise a label said determining comprises adding a ligase to form a ligation complex.

25. The method according to claim 24, wherein said first readout probe comprises a detectable label.

26. The method according to claim 23, further comprising contacting said hybridization complex with at least a first nucleotide and a polymerase, wherein said polymerase extends said first readout probe with said first nucleotide when said first nucleotide is complementary to said first detection position of said first target sequence.

27. (NEW) The method according to claim 14, 21 or 23 wherein said substrate is a fiber optic bundle.

28. (NEW) The method according to claim 14, 21 or 23 wherein said substrate is selected from the group consisting of glass and plastic.

29. (NEW) The method according to claim 14, 21, or 23 further comprising contacting said microspheres with decoder binding ligands, wherein the microspheres of each subpopulation comprises an identifier binding ligand that will bind a decoder binding ligand for identification and elucidation of said target analyte.